

Upper Mississippi River Nine-Foot Channel Project,
Lock and Dam No. 25
Cap-au-Gris, Missouri
Lincoln County, Missouri
Calhoun County, Illinois

HAER No. MO-37

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
Rocky Mountain Regional Office
National Park Service
U. S. Department of the Interior
P.O. Box 25287
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD

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Location: The site is located on the Mississippi River at Cap-au-Gris, Missouri, 241.5 miles above the mouth of the Ohio River. The locks are located along the east shore of Bradley island, approximately 900 feet from the Missouri shore and three miles east of Winfield, Missouri. A roadway and bridge connect Bradley Island with the Missouri mainland. The movable dam extends westward 1,296 feet to an abutment on the west shore of Maple Island. A submersible earth dike, 2,566 feet in length, connects Maple Island to the bluffs along the Illinois shore.

Date of Construction: 1935-1939

Architect/Engineer: U. S. Army Corps of Engineers, Black & Veatch

Builders: United Construction Company, Winona, Minnesota

Present Owner: U. S. Government (St. Louis District, U.S. Army Corps of Engineers)

Present Use: River navigation and control

Significance: The Upper Mississippi River Nine-Foot Channel Project represents one of the largest and most ambitious river improvement projects ever constructed in the United States. The project's origins date to the 1920s and the efforts of Upper Midwest commercial interests to improve their access to markets. During the early years of the Great Depression, the project became transformed into a massive public works program intended to relieve local and regional unemployment.

The locks and dams that comprise the project constitute seminal developments in the technological history of American river navigation projects. The project pioneered the use of non-navigable movable dams in the United States. Designers and engineers from the U.S. Army Corps of Engineers committed themselves to a foreign technology, by their decision to incorporate roller gates into the majority of the project's dams and, more importantly, developed new and improved versions of the simpler and more reliable Tainter gate at such a rapid rate that, by the end of the 1930s, roller gates had become a passe' technology.

The successful completion of the Nine-Foot Channel Project transformed the Upper Mississippi River into an intra-continental canal, providing a fully navigable interior river system throughout the Midwest. The project significantly altered the environment of the Upper Mississippi, but it also served as an impetus for the improvement of drinking water and sewage disposal systems in towns and cities located along the river. Additionally, the project provided new recreational opportunities to the general public.

Historian: Patrick W. O'Bannon, July 1989

PART I. HISTORICAL INFORMATION

A. Physical History

1. Dates of Erection: 1935-1939
2. Architect-Engineer: U. S. Army Corps of Engineers, Black & Veatch
3. Original and Subsequent Owners: U. S. Government
4. Builders, Contractors, Suppliers
 - a. General Contractor -- lock construction: United Construction Company, Winona, Minnesota
 - b. Subcontractors -- lock construction: Mississippi Valley Structural Steel Company (fabricated structural steel and miscellaneous embedded metal), J. C. Theilacker Company (erection and painting of miter gates, Tainter valves, and operating machinery, subcontractor to Mississippi Valley Structural Steel Company), Tri-State Dredging Company (dredged evacuation and fill), Beckman Painting Company (painting of exposed metal items), Commonwealth Electric Company (electrical conduit materials placement), Brown Supply Company (electrical supplies), Central States Construction Company (sand), Century Electric Company (automatic mechanical brakes), Chicago Wood Piling Company (timber piles), James B. Clow & Sons (manhole frames and covers), Colina Timber Company (lumber and building supplies), Crane Company (piping), Drake Marble company (tile gauges), Foote Bros. Gear & Machine Corporation (operating machines), General Electric Company (submarine power), Hill-Behan Lumber Company (lumber and building supplies), Inland Steel Company (steel sheet piling, concrete reinforcement), Line Material company (conduit materials), Moloney Electric Company (transformers), Massey Concrete Products Company (concrete piles), Mississippi Lime & Materials Company (sand), Twin City Lumber & Shingle Company (timber cribbing and lumber), Universal Atlas Cement Company (Portland cement), M. O. Weaver, Inc. (coarse aggregate and stone).
 - c. General Contractor -- dam construction: United Construction Company, Winona, Minnesota.

Subcontractors -- dam construction: American bridge Company (steel fabrication and erection), Universal Atlas Cement Company (Portland cement), Inland Steel Company (steel sheet piling).
5. Original Plans and Construction: U.S. Army Corps of Engineers

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6. Alterations and Additions:

<u>Item</u>	<u>Year</u>
Addition of screened porch to lockkeepers dwellings	1938
Handrails provided along lower guide wall and river wall	1939
Provision of signage	1939
Provision of security lighting	1942
Storage building erected in storage yard	1943
Housings provided for miter gate operating machinery recesses	1946
Housings provided for Tainter valve operating machinery recesses	1946
Provision of handrails at lock walls	1948
Provision of small boat signal for lock	1948
Development of Winfield Public Access Area begun	1964
Winfield Public Access Area comfort station completed	1965
Winfield Public Access Area picnic area completed	1967
Lock gates altered by replacement of diagonals, quoin and miter seals, and timber fenders	1970
Provision of two floating mooring bits within lock	1970
Sanitary sewer facilities upgraded	1972
New residential garage at lockkeepers' houses	1974
Utility shed erected	1975
New comfort station roof installed	1975
Remedial work to lower guide wall	1976
Shelters constructed over tow haulage units	1976
Remedial work at dam to repair uplifts and voids	1977
Lock walkways resurfaced	1978
Repair stone protection	1978
Repair retaining dike at auxiliary lock	1978
Service bridge and dam gates painted	1979
New warehouse roof installed	1979
Lock walkways resurfaced	1980
New generator building roof installed	1980
New boats placed on lock wall davits	1980
Lockkeepers' houses removed from site	1984
Levee above lock repaired by McMenamy Construction Company	1984
Tainter gate repairs	1985
Stone placed on northwest levee by Magruder Construction Company	1985
Dike tops concreted	1988
Central control station enlarged and altered by Freise Construction Company, Old Monroe, Missouri	1988

B. Historical Context

Lock and Dam No. 25 was the second installation within the Corps of Engineers' St. Louis District designed and completed under the upper Mississippi River Nine-Foot Channel Project. Construction began on the main lock in November. The installation was placed in operation in May 1939.

The installation consists of a main lock, located against the east bank of Bradley Island, the upper gate bay section of an auxiliary lock, a 1,296-foot movable dam, a storage yard located adjacent to the dam's east abutment, and a submersible earth dike, 2,566 feet in length, extending to the Illinois shore. Additional structures associated with the installation include an earth dike, extending upstream approximately 5 miles along the Missouri shore from the end of the lock's upper guide wall to Kings Lake levee, and a roadway structure connecting the Missouri shore and Bradley Island. Both the lock and the movable dam are pile-founded structures.

The lock conforms to standard specifications for the Upper Mississippi River Nine-Foot Channel Project. The lock chamber measures 110 feet in width and 600 feet in length. the chamber is floored with 18-inch thick concrete slabs positioned between reinforced concrete struts that provide lateral support to the lock walls. The average lift is 15 feet. The lock is flooded and emptied by means of longitudinal culverts located in the base of the land and intermediate walls. The culverts are predominantly square in section, measuring 12 feet 6 inches by 12 feet 6 inches. A portion of each culvert, located above the midpoint of the lock chamber, is round in section, with a diameter of 14 feet 2 inches. Small ports in the lock walls permit water to enter and leave the lock chamber. Four electrically-operated Tainter valves, located in the lock walls, control the flow of water in the culverts.

The movable portion of the dam is comprised of three roller gates, each 100 feet wide and 20 feet tall, located in the center of the structure and flanked by a total of 14 Tainter gates, each measuring 60 feet wide and 25 feet tall. Both the roller and Tainter gates are raised and lowered by individual motor-driven gear reduction units mounted on the roller gate piers and service bridge spans, respectively. The dam piers are surmounted by a steel deck girder service bridge that extends the entire length of the movable and 215 feet across the storage yard located at the Illinois abutment. A locomotive crane is mounted on the bridge crane rails.

PART II. TECHNOLOGICAL INFORMATION -- LOCK

A. General Statement:

1. Architectural character: Standardized Ohio-mississippi lock design. Drawing M-L 25 20/1.
2. Condition of fabric: Good.

B. Description of General Layout and Principal Elements:

1. Overall dimensions: 110 feet by 660 feet. Drawing M-L 25 20/1.
2. Foundations: Wood, concrete, steel sheet piling in sand. Drawing M-L 25 20/2.

3. Walls: Monolithic reinforced concrete with steel wall armor. Drawing M-L 25 20/1.
4. Structural system: Monolithic reinforced concrete.
5. Bullnoses: Concrete bullnoses with steel wall armor at each end of intermediate wall.
6. Upper and lower guide walls: Monolithic reinforced concrete construction, extensions to land wall, located above and below the lock chamber to assist in guiding traffic into the chamber.

C. Mechanical Equipment:

1. Lockmen's shelters: Operating controls for lock gates and Tainter valves housed in small buildings on land and intermediate walls.
2. Tainter valves: Four electrically-operated, cable-driven steel Tainter valves located in upper and lower ends of lock walls. Drawings M-L 25 20/1, M-L 25 28/0.
3. Lock Gates: Miter gates: Two two-leaf Miter gates balanced on stainless steel pintels. Gates are electrically operated by means of steel sector gears and struts. Motor assemblies housed in machinery rooms located in lock walls adjacent to each gate leaf. Oak timber fenders on gate faces. The upper gates are 27 feet tall. The lower gates are 35 feet tall. An additional set of 35-foot-tall gates, without operating machinery, are located at the upper gate bay of the uncompleted auxiliary lock. Drawings M-L 25 20/1, M-L 25 22/1.
4. Lighting: Various free-standing single- and double-head lighting standards. Heads replaced ca. 1980.
5. Plumbing: Lock chambers are watered by means of longitudinal culverts located in lock walls. Culverts are square in section, measuring 12 feet 6 inches by 12 feet 6 inches. A segment of each culvert, located above the middle point of the lock chamber, are circular in section, measuring 14 feet 2 inches in diameter. Tainter valves (described above) control the flow of water in the culverts. Drawings M-L 25 20/1, M-L 25 28/0.
7. Tow haulage unit: Motorized winch assembly used to assist movement of barges through the lock chambers.

PART III. TECHNOLOGICAL INFORMATION -- MOVABLE DAM

A. General Statement:

1. Architectural character: Type 2a roller gate piers. Operating houses have slit window openings with multiple-light industrial sash, flat roofs, and virtually no architectural embellishment. Drawings M-L 25 40/1, M-L 25 40/2, M-L 25 40/3, M-L 25 41/1.
2. Condition of fabric: Good

B. Description of Exterior:

1. Overall dimensions: 1,296 feet in length. Drawing M-L 25 40/1.
2. Foundations: Wood, concrete, and steel sheet piling in sand.
3. Operating house walls and piers/Tainter gate piers: Monolithic reinforced concrete. Drawings M-L 25 40/1, M-L 25 40/2, M-L 25 40/3, M-L 25 40/19, M-L 25 41/1.
4. Structural system: Monolithic reinforced concrete construction encompassing piers, gate sills, and dam apron. Drawings M-L 25 40/1, M-L 25 40/2, M-L 25 40/3, M-L 25 40/19, M-L 25 40/36, M-L 25 40/42, M-L 25 41/1.
5. Operating house openings: One doorway and 11 slit windows, each with six-light industrial metal sash, for each of the three roller gate operating houses. Drawings M-L 25 40/1, M-L 25 40/2, M-L 25 41/1.
 - a. Doorways and doors: 3
 - b. Windows: 33
6. Operating house roof:
 - a. Shape, covering: Sloped roof with tar and gravel built-up roofing. M-L 25 41/1.
7. Storage house openings: Pier No. 13 storage house has one doorway and 11 slit windows, each with six-light industrial metal sash. Storage house and stair tower located within Pier No. 21 has 2 doorways and 7 slit windows, each with six-light industrial metal sash. Drawing M-L 25 40/1, M-L 25 40/2, M-L 25 41/1.
 - a. Doorways and doors: 3
 - b. Windows: 18
8. Storage house roofs:
 - a. Shape, covering: Sloped roof with tar and gravel built-up roofing. M-L 25 41/1.
 - b. Materials: Structural steel

C. Description of General Layout and Principal Elements:

1. Access plans: Access to dam, from lock, provided by an open metal stairway attached to Pier No. 1. Access from storage yard provided by stair tower contained within Pier No. 21. Drawing M-L 25 40/1.
2. Stairways: Structural steel/poured concrete.

3. Flooring: Steel/reinforced concrete.
4. Wall and ceiling finish: Reinforced concrete in Pier No. 21.
5. Hardware: Brass

D. Mechanical Equipment:

1. Movable gates -- Roller type: Three submersible units, each measuring 100 feet wide by 25 feet tall. Individual electrically-operated chain hoists, with machinery housed in pier-top operating houses, raise and lower the gates on toothed inclined racks. Drawings M-L 25 40/2, M-L 25 41/1, M-L 25 47/2, M-L 25 47/3, M-L 25 54/1, M-L 25 54/2.
2. Movable gates -- Tainter type: Fourteen submersible units, each measuring 60 feet wide by 25 feet tall. Individual gates operated by chain hoists driven by individual electric motors located beneath service bridge spans. Drawings M-L 25 40/3, M-L 25 40/42, M-L 25 48/1.
3. Lighting: Some fixtures extant from ca. 1940 installation. Others replaced and/or rewired.

E. Other Elements:

1. Earth dike: Linear, submersible 2,566-foot dike comprised of steel sheet pile cells with stone and earth fill. Concrete walkway along crest. Dike is located east of storage yard and extends eastward to the Illinois shore. Drawing M-L 25 52/7.
2. Roller and Tainter gate emergency bulkheads: Temporary blocking units of structural steel girder construction used to block gate openings during emergencies or for repairs.
3. Emergency bulkhead cars/tracks: Flatcars and tracks designed to facilitate handling and storage of temporary emergency bulkheads in storage yard. Drawing M-L 25 53/10.
4. Flatcar assembly: Flatcar associated with locomotive crane atop service bridge.
5. Locomotive crane: Rail-mounted gasoline-powered crane, replaced ca. 1980. Located atop service bridge and used to handle heavy equipment and emergency bulkheads. Original "G" type unit. Drawings M-L 25 40/2, M-L 25 40/3.
6. Storage yard: Located at east abutment of movable dam and incorporating Pier Nos. 18-21. Paved yard area measures 214 feet by 126 feet and contains five sets of tracks for storage yard trucks, a metal storage shed, and various spare parts, including the temporary emergency bulkheads and poiree trestles. Drawings M-L 25 40/1, M-L 25 53/10.
7. Boat Launch: Electrically-operated davits located at upper and lower ends of intermediate wall.

PART IV. TECHNOLOGICAL INFORMATION -- ESPLANADE AREA

A. Description of Esplanade -- General Layout:

1. Design character: Standardized park/service area component. Originally designed to accommodate the Central control Station, lockkeepers' dwellings and garage, and various service-related functions. Major site alterations include construction of Winfield Public Access Area in 1960s and removal of lockkeepers' dwellings ca. 1984. Drawing M-L 25 10/40.
2. Historic landscape design: Based on standardized designs.

B. Condition of Site and Structures: Altered.

1. Central control station -- exterior: Standardized construction. Flat roof with parapet. Buff brick walls with precast stone trim, clad with stucco. Office addition attached to north facade. Drawing M-L 25 70/1, M-L 25 70/2, M-L 25 70/3.
 - a. First floor -- interior: Contains control room, with switchboard, offices, toilet room, and stairway access to loft and basement. Drawings M-L 25 70/2, M-L 25 70/3.
 - b. Basement -- interior: Single room used for storage. Drawings M-L 25 70/2, M-L 25 70/3.
2. Outbuildings: Various service buildings and sheds erected over time. None have particular significance or contribute to the character of the site. The shop and maintenance buildings, both erected in the early 1960s, are standardized designs.
3. Observation deck: Raised observation deck located north of central control station.

PART V. SOURCES OF INFORMATION

- A. Original architectural drawings: Construction drawings, Mississippi River Lock & Dam No. 25, half-size copies on file at St. Louis District Office. Additional copies, as well as additional assorted drawings, are on file at the site.
- B. Historic views: Construction photographs -- four bound notebooks on file at the site.
- C. Interviews: Personnel, Lock and Dam No. 25.
- D. Bibliography:
 1. Primary and unpublished sources: Final Construction Report Lock No. 25, on file at the site. Assorted files and records held at the site and at the St. Louis District Office. See bibliography to HAER No. MO-50, Narrative History.

2. Secondary and published sources: See bibliography to HAER No. MO-50, Narrative History.
- E. Likely sources not yet investigated: Documents and reports presently in use by designers and contractors.
- F. Supplemental Material: Aerial Photographs, U.S. Army Corps of Engineers, St. Louis District.

LOCK AND DAM NOS. 24 THROUGH 27 -- INDIVIDUAL SIGNIFICANCE AND INVENTORIES

This report is part of the documentation that outlines the specific technological component of each lock and dam complex, with particular emphasis upon significant and unique engineering elements. Additions and alterations to the various components comprising the individual complexes are also described in this documentation. The principal sources for information pertaining to these additions and alterations are the engineering drawings prepared for individual projects and the detailed repair and maintenance records held at each site. These sources do not comprehensively document the myriad changes, many of a decidedly superficial nature, made to each complex since its construction. Nevertheless, they constitute the only available record of these changes.

Dates for the construction of each complex are given from the onset of work to the completion of the complex and do not necessarily reflect the construction dates for any single element of the installation. Final construction reports survive for Lock and Dam No. 26, Lock No. 25, and Lock No. 24. These reports, held either at the individual sites or at the St. Louis District Office of the Corps of Engineers, concentrate almost exclusively on the actual construction process. The final construction reports include comprehensive lists of contractors and material suppliers, but contain only limited information pertaining to design, project administration, politics, and environmental issues.

Dimensions for the movable gate sections have been rounded, in accordance with common contemporary practice. For example, roller gates that measure 88 feet 10-1/2 inches in length are identified in construction drawings, completion reports, photographs, and this report, as 80-foot gates. Therefore, all gate measurements should be considered approximate rather than absolute.

Users of this documentation should note that, although many of the complexes appear identical, some architectural and engineering components vary significantly between complexes. This variation is most obvious in the disparity between the appearance of the three installations, Lock and Dam Nos. 24-26, constructed during the 1930s, with Lock and Dam Nos. 26R and 27, constructed after World War II. However, there are subtle variations in the design of gate piers, gates, control stations, and other elements at each of the three 1930s installations. These variations largely reflect improvements in engineering practice that permitted the elimination of structurally unnecessary material. The open design of the Tainter gate piers at Dam No. 24, as contrasted with the more massive, monolithic design at the earlier Dam No. 26, provides perhaps the most obvious example of this type of variation. A fuller discussion of the architectural and engineering evolution of the St. Louis District installations is included within the narrative history portion of this documentation.